J. N. MAHONEY.

CIRCUIT BREAKER.

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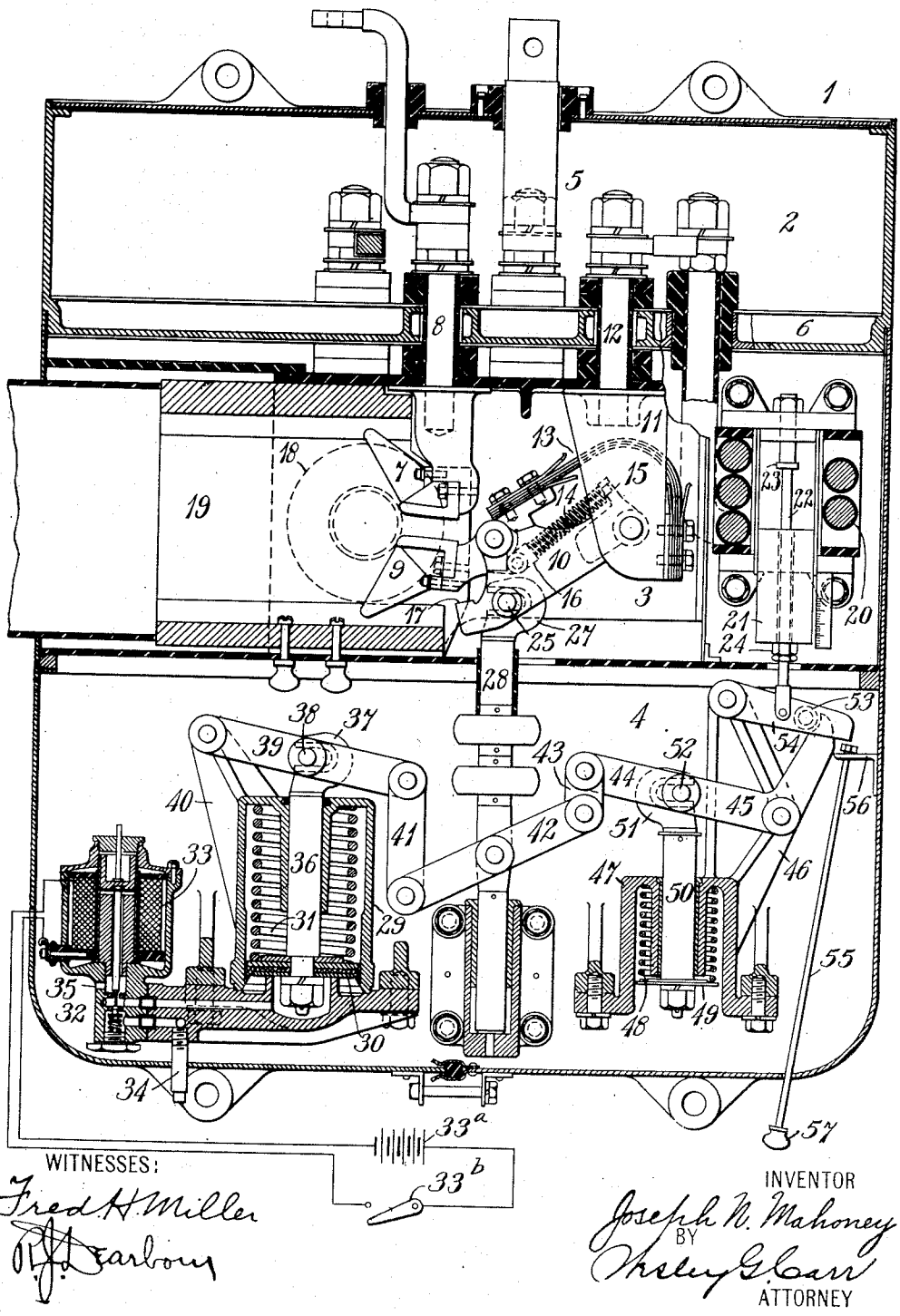
1,045,866.

Patented Dec. 3, 1912.



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CIRCUIT-BREAKER.

1,045,866. Specification of Letters Patent. Patented Dec. 3, 1912.

Application filed October 8, 1910. Serial No. 586,084.

To all whom it may concern:

Be it known that I, JOSEPH N. MAHONEY, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Circuit-Breakers, of which the following is a specification.

My invention relates to circuit breakers and it has for its object to provide an efficient device of this character for use in connection with circuits having large currents and moderately high voltages which may be closed by compressed air and so locked in its closed position that it may be released and opened, either automatically or manually, while the air pressure is applied to the closing mechanism, and the closing, opening and resetting of which may be effected through the agency of a simple, single pole electric switch located at any convenient point.

The single figure of the accompanying drawing is a vertical sectional view of a circuit breaker embodying my invention, and the working members of the apparatus, to be hereinafter described in detail, are mounted in a casing comprising three compartments, 2, 3 and 4. The upper compartment 2 is provided with a plurality of terminal devices 5 which project through the partition 6 between the upper and middle compartments for connection to the respective current-carrying parts which are located in the middle compartment.

The upper contact member 7 of the breaker is rigidly mounted upon the lower end of a terminal rod 8, and the lower contact member 9 is pivotally mounted upon an arm 10, one end of which is, in turn, pivotally mounted upon a block 11 which is suspended from the partition 6 and is rigidly joined to the lower end of a terminal rod 12.

A flexible current-carrying shunt 13, connects the movable contact member 9 to the block 11 upon which the arm is pivoted. A helical spring 14 is interposed between a shoulder 15 on the end of the arm 10 and a block 16 which is pivoted to the member 9 adjacent to the pivot or shaft on which it is mounted, in order that the spring may be compressed when the contact members 7 and 9 are brought into engagement and thus permit the movable member to yield sufficiently to insure an effective contact engagement between the two contact faces. The arm 10 is also provided with a shoulder or stop projection 17 to limit the degree of movement of the contact member 9 upon its pivot, in opposition to the spring 14.

A blow-out magnet 18 is mounted in the middle chamber adjacent the contact members 7 and 9, and an arc chute 19 opens to the atmosphere through one side of the casing. A solenoid 20, which is connected in series circuit with the contact members, is also located within the middle chamber, and is provided with a core 21 having a rod 22 upon which it is loosely mounted between steps or shoulders 23 and 24. The arm 10 is provided with a laterally projecting pin 25 which is engaged by a hook 27 upon the upper end of a vertical rod 28, the major portion of the rod being located in the lower chamber 4 and being mounted in suitable bearings for vertical reciprocation.

A vertical cylinder 29 is located at one side of the rod 28 and is provided with a piston 30 which is normally held in the lower end of the cylinder by means of a helical spring 31 and is moved upwardly by compressed air, the application of which to the piston is controlled by a valve 32 and an operating magnet 33, the latter being energized from any suitable source such as a battery 33^a, the circuit of which may be made and broken by a simple switch 33^b. Compressed air is admitted through a pipe 34 from a suitable source and is exhausted to the atmosphere through the passage 35 when the magnet is deënergized. The upper end of the piston rod 36 is provided with a hook 37 to engage a pin 38 that projects laterally from an intermediate portion of a lever 39, one end of which is pivotally mounted upon a bracket 40 and the other end of which is pivotally connected to the upper end of a link 41. Substantially the middle point of a lever 42 is pivotally connected to the vertical rod 28 and its respective ends are pivotally connected to the lower ends of links 41 and 43. The upper end of the link 43 is pivotally connected to the free end of the long arm 44 of a bell crank lever 45 that is pivotally mounted, at

the junction between its two arms, upon a bracket 46 which constitutes a part of, or is rigidly mounted upon the casing 47 of a spring 48. The spring 48 is interposed between the upper end of the casing 47 and a disk 49 upon the lower end of a reciprocatory rod 50, the upper end of the rod being in the form of a hook 51 to engage a pin 52 that projects laterally from an intermediate point of the long arm 44 of the bell crank lever 45. The bell crank lever 45 constitutes a latch, the free end of which engages a roller 53 upon a trigger 54 that is pivoted, at one end, to the bracket 46 and is connected, at an intermediate point, to the rod 22 of the solenoid core 21. A rod 55, for operating the trigger manually, is supported, by means of a bracket 56 in the inside of the casing and projects through the casing and has a handle 57 at its lower end.

When the parts are in the positions indicated in the drawing, and the magnet 33 is energized, by closing the switch 33^b, air pressure is admitted to the cylinder 29 and moves the piston 30 upwardly, in opposition to the spring 31, and, since the trigger 54 holds the bell crank lever 45 against movement, the interconnected links and levers serve to raise the reciprocatory rod 28 and the movable contact member 9 of the breaker to effect circuit-closing engagement between the contact members, and, so long as the air pressure is maintained in the cylinder 29, the circuit breaker will be held closed unless a short circuit or overload upon the circuit in which the breaker is located effects such energization of the solenoid 20 as to raise the core 21 and, with it, the trigger 54, and thus permit the link and lever mechanism to release and drop the movable member of the breaker, or unless the trigger is tripped by means of the rod 55. In case the air pressure is withdrawn from the cylinder 29, the circuit breaker will automatically open, whatever may be the condition of the main circuit.

In case the circuit interrupter is opened by tripping the trigger 54, it may be reset by merely exhausting the air pressure from the cylinder 29 since the spring 31 is stronger than the spring 48 and acts in opposition to it, although both springs tend to open the circuit breaker.

It will be understood that the switch 33^b be located at any convenient point which is more or less remote from the breaker and that the breaker may be closed, opened and reset by merely closing, opening and closing said switch.

While the mechanism shown in the drawing and hereinbefore described, has been found satisfactory in practical service, the desired results may, of course, be secured by mechanism, the details of which differ from those here set forth, and I, therefore, desire that no limitations shall be imposed which are not expressly set forth in the appended claims.

I claim as my invention:

1. In a circuit breaker, the combination with two pivotally supported levers, an intermediate lever and connecting links, of a stationary contact member, a movable contact member connected to said intermediate lever, a pneumatically actuated means connected to one of said pivotally supported levers, electromagnetic means for controlling the application of pneumatic pressure, a latch for the other pivotally supported lever, and means for actuating the latch to permit the breaker to open while the pneumatic pressure is applied.

2. In a circuit breaker, the combination with two pivotally supported end levers, an intermediate lever and a pair of relatively movable contact members one of which is pivotally connected to said intermediate lever, of electrically controlled means for applying pneumatic pressure to one of said end levers to effect engagement between said contact members, a latch for the other end lever of the train, an electromagnetic tripping means and a manually operable tripping device either of which may be utilized for withdrawing the latch to permit the breaker to open while the pneumatic pressure is applied.

3. In a circuit breaker, the combination with a stationary contact member and a movable contact member, of a cylinder, a piston, a spring acting on the piston and tending to open the breaker, means for applying pneumatic pressure to said piston in opposition to said spring, a latch, tripping means and a set of links and levers interposed between said piston and said latch and having an intermediate connection to the movable contact member, said spring acting to set the latch when the pneumatic pressure is exhausted from the cylinder.

4. The combination with two pivotally supported levers, an intermediate lever and links connecting the respective ends of the intermediate lever to the adjacent ends of the pivotally supported levers, of a stationary contact member, a movable contact member connected to said intermediate lever, means for actuating one of the pivotally supported levers, a latch for the other pivotally supported lever, and means for actuating said latch.

5. A circuit breaker comprising a reciprocable contact-bearing member, a lever pivotally connected thereto intermediate its ends, means acting oppositely with unequal intensity at the respective ends of the lever and electrically controlled means for opposing the stronger means and a latch for rendering the weaker means ineffective.

6. A circuit breaker comprising a recip-

rocable contact-bearing member, a lever pivotally connected thereto intermediate its ends, means acting oppositely with unequal intensity at the respective ends of the lever and electrically controlled means for opposing the stronger means, a latch for rendering the weaker means ineffective and a release coil for the latch permitting the weaker means to act independently of the stronger means.

7. A circuit breaker comprising a reciprocable contact-bearing member, a lever pivotally connected thereto intermediate its ends, springs acting oppositely with unequal intensity at the respective ends of the lever, electrically controlled means for opposing the stronger spring and a latch for rendering the weaker spring ineffective.

8. A circuit breaker comprising a reciprocable contact-bearing member, a lever pivotally connected thereto intermediate its ends, means acting oppositely with unequal intensity at the respective ends of the lever and electrically controlled means for opposing the stronger means, a latch for rendering the weaker means ineffective and a release coil for the latch permitting the weaker means to act independently of the stronger means.

9. A circuit breaker comprising a movable contact-bearing member, a lever pivoted thereon intermediate its ends, compression springs acting oppositely with unequal force at its respective ends, electrically controlled means for opposing the expansion of the stronger spring and a latch for preventing the expansion of the weaker spring.

10. A circuit breaker comprising a movable contact-bearing member, a lever pivoted thereon intermediate its ends, compression springs acting oppositely with unequal force at its respective ends and both tending to open the circuit breaker, electrically controlled means for opposing the expansion of the stronger spring and closing the circuit breaker and a latch for preventing the expansion of the weaker spring.

11. A circuit breaker comprising a movable contact-bearing member, a lever pivoted thereon intermediate its ends, compression springs acting oppositely with unequal force at its respective ends and both tending to open the circuit breaker, electrically controlled means for opposing the expansion of the stronger spring and closing the circuit breaker, a latch for preventing the expansion of the weaker spring, and means depending upon a predetermined current traversing the circuit breaker for tripping the latch and permitting the weaker spring to open the circuit breaker independently of the electrically controlled means.

12. A circuit breaker comprising a reciprocable contact-bearing member, a lever pivotally connected thereto intermediate its ends, means acting oppositely with unequal intensity at the respective ends of the lever and both tending to open the circuit breaker, a latch for rendering the weaker means ineffective, and closing means for opposing the stronger means and closing the circuit breaker, said weaker means serving to open the circuit breaker independently of said closing means when released and said stronger means serving to reset the latch when released.

13. A circuit breaker comprising a reciprocable contact-bearing member, a lever pivotally connected thereto intermediate its ends, springs acting oppositely with unequal intensity at the respective ends of the lever and both tending to open the circuit breaker, a latch for restraining the weaker spring, and closing means for opposing the stronger spring and closing the circuit breaker, said stronger spring serving to compress the weaker spring and set the latch when both are free to act.

14. A circuit breaker comprising a reciprocable contact-bearing member, a lever pivotally connected thereto intermediate its ends, springs acting oppositely with unequal intensity at the respective ends of the lever and both tending to open the circuit breaker, a latch for restraining the weaker spring, and closing means for opposing the stronger spring and closing the circuit breaker, said weaker spring serving to open the circuit breaker independently of said closing means when released and said stronger spring serving to compress the weaker spring and set the latch when released.

15. A circuit breaker comprising a reciprocable contact-bearing member, a lever pivotally connected thereto intermediate its ends, springs acting oppositely with unequal intensity at the respective ends of the lever and both tending to open the circuit breaker, a latch for restraining the weaker spring, electro-responsive means for opposing the stronger spring and closing the circuit breaker, and means dependent upon a predetermined current traversing the contacts of the circuit breaker for releasing the latch, said weaker spring serving to open the circuit breaker independently of said electro-responsive closing means when the latch is released.

16. A circuit breaker comprising a reciprocable contact-bearing member, a lever pivotally connected thereto intermediate its ends, springs acting oppositely with unequal intensity at the respective ends of the lever and both tending to open the circuit breaker, a latch for restraining the weaker spring, electro-responsive means for opposing the stronger spring and closing the circuit breaker, and means dependent upon a predetermined current traversing the contacts of the circuit breaker for releasing the latch,

said weaker spring serving to open the circuit breaker independently of said electro-responsive closing means when the latch is released and said stronger spring serving to compress the weaker spring and set the latch when it is released.

In testimony whereof, I have hereunto subscribed my name this 30th day of Sept. 1910.

JOSEPH N. MAHONEY.

Witnesses:
OLIVER P. HIPPLE,
B. B. HINES.